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The stomach is ‘Green’ too!

Ironically, digestion of food, which consumes energy, also consumes carbon dioxide, says S.Ananthanarayanan..

An important agent in the digestion of food is hydrochloric acid. As soon as we see or smell food, or even as mealtime approaches, processes in the stomach wall start secreting a range of digestive agents, including hydrochloric acid. HCl directly helps in digestion of protein and also makes sure that bacteria and fungi do not multiply and thrive in the stomach.

Protein digestion

Pepsin is the enzyme that helps break proteins down into the amino acids of which they are composed. This is the form in which proteins can be absorbed by the body and then made use of to build proteins, tissue and other enzymes. The body, in fact does not secrete pepsin directly, but secretes pepsinogen, the precursor of pepsin. As soon as the HCl level builds up and the stomach is sufficiently acid, the pepsinogen converts to pepsin, which begins to act on proteins.

Keeping it acid

The work that pepsin does is the first part of the complicated work of breaking down proteins. Pepsin does this first part in the acid environment in the stomach. The next part of the work goes on in the small intestine and the enzymes that work there need a more alkaline medium. But pepsin, in the stomach, does the first unwinding of the complex protein molecule.

A number of other digestive processes also depend on the stomach being at a fairly strong acidic level. Absorption of a number of nutrients, including folic acid, iron, calcium, magnesium, zinc is made possible by the level of acid. This role apart, acidity of the stomach prevents bacteria and fungi from proliferating in the stomach and the intestines.

Where does it come from?

An acid is an acid basically because it is a source of hydrogen ions. Hydrochloric acid is made up of hydrogen and chlorine atoms, both atoms being ionized and charged, the first positive and the second negative, so that they bond chemically, like this: $H^+ + Cl^- = HCl$. In solution, the H^+ and Cl^- float apart and H^+ is available to combine with or act on other reagents, like pepsinogen, thus qualifying HCl to be an acid.

The most important source of chlorine, for HCl to form, is Sodium Chloride, NaCl, or common salt, which we ingest with our food. In the body, NaCl is ample in the blood plasma, which is always somewhat saline. The source for hydrogen, the other component

of HCl, is the water in the blood plasma, set free through the peculiar reaction that uses up carbon dioxide.

The parietal cells

In these cells called parietal cells, an enzyme called carbonic anhydrase catalyses a reaction where carbon dioxide strips water, or H_2O, of its OH^- portion, leaving behind a free H^+ ion. The parietal cells pump these hydrogen ions into the stomach, exchanging them for potassium ions, K^+. The OH^- portion which is left behind combines with carbon dioxide, CO_2, to form the bicarbonate ion, HCO_3^-, which then combines with sodium ions, Na^+, in the blood plasma. This frees the chlorine ions, Cl^- of the blood plasma, which pass into the stomach. And there, we have H^+ and Cl^- delivered into the stomach, to create the acid environment and all that follows.

This also means that the stomach, while it is active in the process of metabolism, *consumes* carbon dioxide, unlike most other organs, which *produce* carbon dioxide.